WHAT IS CLAIMED IS:

1. A positioning system for positioning an object in a predefined direction, the positioning system comprising:

a microfabricated positioning assembly comprising:

a stationary support structure;

a moveable support structure movably coupled to the support structure and moveable within a range of movement in the predefined direction with respect to the support structure;

a positionable support structure positionable in the predefined direction;

a stationary support structure clamp to clamp and unclamp the positionable support structure to and from the stationary support structure;

a moveable support structure clamp to clamp and unclamp the positionable support structure to and from the moveable support structure; and

a controller to control positioning of the positionable support structure in the predefined direction within a range of positioning that is larger than the range of movement of the moveable support structure by controlling (A) the stationary support structure clamp in clamping and unclamping the positionable support structure to and from the stationary support structure, (B) the moveable support structure clamp in clamping and unclamping the positionable structure to and from the moveable support structure, and (C) the movement of the moveable support structure;

the object being disposed on the positionable support structure so that the object is positionable in the predefined direction within the range of positioning.

2. A positioning assembly as recited in claim 1 wherein the positionable structure is positioned at nanometer level increments.

3. A positioning assembly as recited in claim 2 wherein the range of movement is on a micrometer level.

4. A positioning assembly as recited in claim 3 wherein the range of positioning is on a millimeter level.

5. A positioning system as recited in claim 1 further comprising:

an electrostatic comb drive to electrostatically movably couple the moveable structure to the stationary support structure, the electrostatic comb drive comprising:

a stationary comb structure connected to the stationary support structure; and

a moveable comb structure connected to the moveable support structure, the moveable comb structure electrostatically interacting with the stationary comb structure to move in the predefined direction with the moveable support structure;

the controller controlling the movement of the moveable structure by controlling the electrostatic interaction of the stationary and moveable comb structures.

6. A positioning system as recited in claim 1 further comprising:

a piezoelectric drive connected between the stationary and moveable support structures to movably couple the moveable support structure to the stationary support structure, the piezoelectric drive expanding and contracting in the predefined direction to move the moveable support structure in the predefined direction;

the controller controlling the movement of the moveable support structure in the predefined direction by controlling the expansion and contraction of the piezoelectric drive.

7. A positioning system as recited in claim 1 further comprising:

a heater drive to movably couple the moveable structure to the support structure, the heater drive comprising:

a thermally expandable and contractible structure connected between the stationary and moveable support structures; and

heater elements disposed on the thermally expandable and contractible structure to thermally expand and contract the thermally expandable and contractible structure in the predefined direction to move the moveable support structure in the predefined direction;

the controller controlling the movement of the moveable support structure by controlling the thermal expansion and contraction of the thermally expandable and contractible structure by the heater elements.

8. A positioning assembly as recited in claim 1 wherein at least one support structure clamp and the at least one moveable structure clamp are connected to the positionable structure.

9. A positioning assembly as recited in claim 8 wherein:

the support structure includes support structure rails extending in the

predefined direction;

the stationary support structure clamp clamps and unclamps the positionable support structure to and from the stationary support structure rails;

the moveable support structure includes rails extending in the predefined direction; and

the moveable support structure clamp clamps and unclamps the positionable support structure to and from the moveable support structure rails.

10. A data storage device comprising:

a deformable storage medium;

one or more write probes each comprising:

a write tip comprising a highly obdurate coating capable of deforming the storage medium;

a write tip positioning apparatus to position the write tip with respect to the storage medium;

one or more read probes each including a conductive read tip;

a probe and storage medium positioning apparatus to position the read and write probes with respect to each other;

a controller to (A) during a write mode, control the probe and storage medium positioning apparatus in positioning the write probes over the storage medium, (B) during the write mode, control each write tip positioning apparatus in lowering the corresponding write tip a predetermined amount into the storage medium so as to cause a predetermined amount of deformation in the storage medium representing data written thereto, (C) during a read mode, control the probe and storage medium positioning apparatus in positioning the read probes over the storage medium, and (D) during the read mode, produce and measure a tunneling current between each conductive read tip and the storage medium to identify a predetermined amount of deformation caused in the storage medium below the corresponding read tip during the write mode so that the data written thereto is read therefrom.

11. A data storage device as recited in claim 10 further comprising:

a heater element below the storage medium;

the controller controlling during erase modes the heater element to heat the storage medium until deformations caused in the storage medium are removed.

12. A data storage device as recited in claim 10 further comprising:

a plurality of heater elements below the storage medium;

the controller controlling during an erase mode a selected one of the heater elements to heat the storage medium until deformations caused in the storage medium above the selected one of the heater elements are removed.

13. A data storage device as recited in claim 10 wherein:

each read tip further comprises:

a core material with a sharp end; and

an insulating coating over the core material except at the sharp end;

the highly obdurate coating being over the core material at the sharp end and the insulating coating;

the controller (A) during an erase mode, controls the probe and storage medium positioning apparatus in positioning the read probes over the storage medium, and (B) during the erase mode, produces a current between the conductive coating and the core material of each read tip to heat the storage medium below the corresponding read tip until a deformation caused in the storage medium below the corresponding read tip during the write mode is removed.

14. A data storage device as recited in claim 10 wherein the highly obdurate material comprises diamond.

15. A data storage device as recited in claim 10 wherein:

the tip has a sharp end; and

the diamond is aligned at the sharp end with a bias field at the sharp end during growth of the diamond.

16. A data storage device as recited in claim 10 wherein the highly obdurate material comprises silicon carbide.

17. A data storage device as recited in claim 10 wherein the highly obdurate material comprises carbon nitride.

18. A data storage device as recited in claim 1 wherein:

the positioning apparatus includes a moveable support structure to which the

write probes are connected;

the controller controlling positioning of the moveable support structure and the storage medium with respect to each other during the write mode to control positioning of the write probes over the storage medium;

the write tip positioning apparatus of each write probe comprising:

a cantilever connected to the moveable support structure and on which is located the write tip of the write probe;

a cantilever mover to move the cantilever;

the controller controlling during the write mode each cantilever mover to move the corresponding cantilever a predetermined amount so as to lower the corresponding write tip into the storage medium a predetermined amount to cause a predetermined amount of deformation in the storage medium.

19. A data storage device as recited in claim 18 wherein:

the cantilever mover of each write probe comprises a heater element disposed on the cantilever of the write probe;

the controller controls during the write modes each heater element to thermal expandably move the corresponding cantilever a predetermined amount so as to lower the corresponding write tip into the storage medium the predetermined amount to cause the predetermined amount of deformation in the storage medium.

20. A data storage device as recited in claim 18 wherein:

the cantilever mover of each write probe comprises an insulating material on the base support structure under the corresponding cantilever and a conductive material on the insulating material so as to form a capacitor;

the controller controls during the write mode energy storage by each capacitor to electrostatically move the corresponding cantilever a predetermined amount so as to lower the corresponding write tip into the storage medium the predetermined amount to cause the predetermined amount of deformation in the storage medium.

21. A data storage device comprising:

a deformable storage medium;

a plurality of probes each comprising:

a tip comprising a conductive highly obdurate coating capable of deforming the storage medium;

a tip positioning apparatus to lower the tip;

a probe and storage medium positioning apparatus to position the probes over the storage medium;

a controller to (A) during a write mode, control the probe and storage medium positioning apparatus in positioning the probes over the storage medium, (B) during the write modes, control each tip positioning apparatus in lowering the corresponding tip a predetermined amount into the storage medium so as to cause a predetermined amount of deformation in the storage medium representing data written thereto, (C) during read modes, control the probe and storage medium positioning apparatus in positioning the probes over the storage medium, (D) during the read modes, control each tip positioning apparatus in lowering the corresponding tip close to the storage medium, and (E) during the read mode, produce and measure a tunneling current between the conductive obdurate coating of each tip and the storage medium to identify a predetermined amount of deformation caused in the storage medium below the corresponding tip during the write mode so that the data written thereto is read therefrom.

22. A data storage device as recited in claim 21 further comprising:

a heater element below the storage medium;

the controller controlling during erase modes the heater element to heat the storage medium until deformations caused in the storage medium are removed.

23. A data storage device as recited in claim 21 further comprising:

a plurality of heater elements below the storage medium;

the controller controlling during an erase mode a selected one of the heater elements to heat the storage medium until deformations caused in the storage medium above the selected one of the heater elements are removed.

24. A data storage device as recited in claim 21 wherein:

each tip further comprises:

a core material with a sharp end; and

an insulating coating over the core material except at the sharp end;

the conductive highly obdurate coating being over the core material at the sharp end and the insulating coating;

the controller (A) during an erase mode, controls the probe and storage medium positioning apparatus in positioning the read probes over the storage medium, and

(B) during the erase mode, produces a current between the conductive coating and the core material of each tip to heat the storage medium below the corresponding tip until a deformation caused in the storage medium below the corresponding tip during the write mode is removed.

25. A data storage device as recited in claim 21 wherein the conductive highly obdurate material comprises diamond doped to be conductive.

26. A data storage device as recited in claim 24 wherein:

the tip has a sharp end; and

the diamond is aligned at the sharp end with a bias field at the sharp end during growth of the diamond.

27. A data storage device as recited in claim 21 wherein the conductive highly obdurate material comprises silicon carbide doped to be conductive.

28. A data storage device as recited in claim 21 wherein the conductive highly obdurate material comprises carbon nitride doped to be conductive.

29. A data storage device as recited in claim 21 wherein:

the positioning apparatus includes a moveable support structure to which the probes are connected;

the controller controlling positioning of the moveable support structure and the storage medium with respect to each other during the write mode to control positioning of the probes over the storage medium;

the tip positioning apparatus of each write probe comprising:

a cantilever connected to the moveable support structure and on which is located the tip of the probe;

a cantilever mover to move the cantilever;

the controller controlling during the write mode each cantilever mover to move the corresponding cantilever a predetermined amount so as to lower the corresponding tip into the storage medium the predetermined amount to cause the predetermined amount of deformation in the storage medium.

30. A data storage device as recited in claim 28 wherein:

the cantilever mover of each probe comprises a heater element disposed on the

cantilever of the probe;

the controller controls during the write modes each heater element to thermal expandably move the corresponding cantilever a predetermined amount so as to lower the corresponding tip into the storage medium the predetermined amount to cause the predetermined amount of deformation in the storage medium.

31. A data storage device as recited in claim 28 wherein:

the cantilever mover of each probe comprises an insulating material on the base support structure under the corresponding cantilever and a conductive material on the insulating material so as to form a capacitor;

the controller controls during the write mode energy storage by each capacitor to electrostatically move the corresponding cantilever a predetermined amount so as to lower the corresponding tip into the storage medium the predetermined amount to cause the predetermined amount of deformation in the storage medium.

32. A data storage device comprising:

a storage medium alterable by light;

one or more light emitting write probes capable of emitting light;

one or more read probes capable of detecting alterations of the storage medium;

a positioning apparatus to position the read and write probes over the storage medium;

a controller to (A) during a write mode, control the positioning apparatus in positioning the write probes over the storage medium so that the light emitting write tips are over the storage medium, (B) during the write mode, control each light emitting write probe to emit a predetermined amount of light so as to cause a predetermined amount of alteration of the storage medium and write data thereto, (C) during read modes, control the positioning apparatus in positioning the read probes over the storage medium so that each read probe detects a predetermined amount of alteration of the storage medium caused during the write mode, and (D) during the read mode, measure each detected predetermined amount of alteration of the storage medium so that the data written to the storage medium during the write mode is read therefrom.

33. A data storage device as recited in claim 32 wherein:

each light emitting write probe includes a write tip comprising:

a core material with a sharp end,

a light emissive coating over the core material; and

a conductive coating over the light emissive coating;

the controller is coupled to the core material and the conductive coating of each light emitting write tip to apply across them during the write mode a voltage of predetermined amount so that the sharp end of the corresponding light emitting write tip emits a predetermined amount of light so as to cause a predetermined amount of alteration of the storage medium

34. A data storage device as recited in claim 32 wherein:

each light emitting write tip comprises porous silicon;

the controller is coupled to each light emitting write tip to produce during the write mode a current of predetermined amount in the porous silicon of the light emitting write tip so that it emits a predetermined amount of light so as to cause a predetermined amount of alteration of the storage medium.

35. A data storage device as recited in claim 32 wherein:

the storage medium comprises:

charge storage cells each storing a charge alterable by light;

a conductor around the charge storage cells;

each read probe is conductive;

the controller (A) during the write mode, controlling each write probe to emit a predetermined amount of light so as to cause a predetermined amount of charge in a corresponding one of the charge storage cells to be leaked off so as to write data thereto, (B) during the read mode, controlling the positioning apparatus in positioning each read probe over a corresponding one of the charge storage cells to detect the predetermined amount of charge therein leaked off during the write mode, (C) during the read mode, measure the detected predetermined amounts of charges leaked off so that data written during the write mode to the corresponding ones of the charge storage cells is read therefrom, and (D) during an erase mode, controlling the conductor to transfer a predetermined amount of charge to the corresponding charge storage cells so as to restore the charges therein leaked off during the write mode.

36. A data storage device as recited in claim 32 wherein:

the storage medium comprises:

charge storage cells each storing a charge alterable by light;

a plurality of conductors around the charge storage cells;

each read probe is conductive;

the controller (A) during the write mode, controlling each write probe to emit a predetermined amount of light so as to cause a predetermined amount of charge in a corresponding one of the charge storage cells to be leaked off so as to write data thereto, (B) during the read mode, controlling the positioning apparatus in positioning each read probe over a corresponding one of the charge storage cells to detect the predetermined amount of charge therein leaked off during the write mode, (C) during the read mode, measure the detected predetermined amounts of charges leaked off so that data written during the write mode to the corresponding ones of the charge storage cells is read therefrom, and (D) during an erase mode, controlling a selected one of the conductors to transfer a predetermined amount of charge to the corresponding charge storage cells so as to restore the charges therein leaked off during the write mode.

37. A data storage device comprising:

an electrically alterable storage medium;

a triangular ridge support structure;

one or more triangular ridges on the base structure;

a positioning apparatus to position the triangular ridge support structure over the storage medium;

an acoustic wave generator on one of the triangular ridge support structure and the storage medium to produce surface acoustic waves thereon that propagate in a direction parallel to the axial length of the triangular ridges;

a controller to (A) during a write mode, control the positioning apparatus in positioning the triangular ridge support structure over the storage medium so that each triangular ridge is over a corresponding region of the storage medium to be written, (B) during the write mode, control the acoustic wave generator to produce an acoustic wave, (C) during the write mode, apply at a predetermined time across each triangular ridge and the storage medium a voltage pulse having a predetermined voltage and duration while the acoustic wave produced during the write mode propagates so that a region of the triangular ridge above the corresponding region to be written is displaced down theretoward and the corresponding region to be written is electrically altered by a predetermined amount, (D) during a read mode, control the positioning apparatus in positioning the triangular ridge

support structure over the storage medium so that each triangular ridge is over a corresponding region of the storage medium to be read, (E) during the read mode, control the acoustic wave generator to produce an acoustic wave, (F) during the read mode, detect with each triangular ridge at a predetermined time while the acoustic wave produced during the read mode propagates so that a region of the triangular ridge above the corresponding region to be read is displaced down theretoward a predetermined amount of electrical alteration of the corresponding region to be read, (G) during the read mode, measure each detected predetermined amount of electrical alteration of the corresponding region to be read so that the data written to thereto during the write mode is read therefrom.

38. A biochemical instrument comprising:

a probe comprising:

a porous tip;

a tip positioning apparatus to position the tip with respect to a sample material;

a tip and sample positioning apparatus to position the probe and sample material with respect to each other;

a controller to (A) control the positioning apparatus in positioning the probe over the sample, (B) control the tip positioning apparatus in lowering the tip into the sample material to produce a biochemical interaction between the porous tip and the sample material.